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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/534,633	05/11/2005	Avto Tavkhelidze	12091	8643

7590 02/28/2007  
Borealis Technical  
23545 NW Skyline Blvd  
North Plains, OR 97133-9205

EXAMINER
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LIU, BENJAMIN T

ART UNIT	PAPER NUMBER
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2826

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/28/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/534,633

Applicant(s)

TAVKHELIDZE ET AL.

Examiner

Benjamin T. Liu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

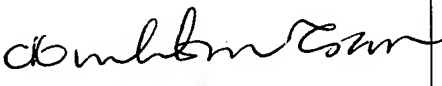
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 December 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 15-21 is/are allowed.
- 6) ☒ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

  
Minhloan Tran  
Primary Examiner  
Art Unit 2826

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 12/19/06.

- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Allowable Subject Matter*

1. Claims 15-21 allowed.

Claim 15 is allowable over the reference of record because none of the references disclose or can be combined to yield the claimed invention such as the method for cooling wherein there is an emitter and collector separate by a vacuum with an insulating layer on the collector, and wherein the electrons tunnel from the emitter to the collector thereby cooling the emitter as recited in claim 15.

### *Claim Rejections - 35 USC § 102(e)*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 6-8, and 13-14 are rejected under 35 U.S.C 102(e) as being anticipated by Sung (2003/0168957)

With regard to claim 1, figure 2 of Sung discloses a thermotunneling device comprising a collector electrode 25 and an emitter 30 electrode, the collector electrode 25 having a surface facing the emitter electrode 30, characterized in that an insulator layer 5 covers the surface of the collector electrode 25 and is separated from the emitter

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electrode 30 by a distance  $d_1$ , wherein  $d_1$  is greater than zero. (Claim 1 does not disclose how the emitter and collectors function as such therefore claim 1 does not distinguish over Sung)

With regard to claim 6, figure 2 of Sung discloses the limitation, in which the emitter electrode 30 comprises a metal. (Note par [0053])

With regard to claim 7, figure 2 of Sung discloses the limitation, in which the collector electrode 25 comprises a metal. (Note par [0053])

With regard to claim 8, figure 2 of Sung discloses the limitation, a method for enhancing electron tunneling between an emitter 30 and collector 25 electrode, the collector electrode 25 having a surface facing the emitter electrode 30, comprising the step of covering the surface of the collector electrode 25 with an insulator 5 wherein the insulator 5 is separated from the emitter electrode 30 by a distance  $d_1$ , wherein  $d_1$  is greater than zero. (Claim 8 does not disclose how the emitter and collectors function as such therefore claim 8 does not distinguish over Sung)

With regard to claim 13, figure 2 of Sung discloses the limitation, in which the emitter electrode 30 comprises a metal. (Note par [0053])

With regard to claim 14, figure 2 of Sung discloses the limitation, in which the collector electrode 25 comprises a metal. (Note par [0053])

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2, 3, 4, 5, 9, 10, 12 are  
Claims <sub>1</sub> rejected under 35 U.S.C 103(a) as being unpatentable over Sung  
(2003/0168957) in view of Huffman (3,169,200).

With regard to claim 2, Sung discloses all the subject matter claimed except for the limitation, in which the insulator layer comprises a metal oxide.

However, figure 3 of Huffman discloses the limitation, in which the insulator layer (OXIDE SPACERS) comprises a metal oxide. (Note line 75 col 4)

Therefore, it would have been obvious to one of ordinary skill in the art to form the device of Sung with the limitation of Huffman in order to produce a potential barrier with an effective thickness less than that of vacuum. (Note lines 60-67 col 2 of Huffman)

With regard to claim 3, Sung discloses all the subject matter claimed except for the limitation, in which the metal oxide is aluminum oxide.

However, figure 3 of Huffman discloses the limitation, in which the metal oxide (OXIDE SPACERS) is aluminum oxide. (Note line 75 col 4)

Therefore, it would have been obvious to one of ordinary skill in the art to form the device of Sung with the limitation of Huffman in order to produce a potential barrier with an effective thickness less than that of vacuum. (Note lines 60-67 col 2 of Huffman)

With regard to claim 4, Sung discloses all the subject matter claimed except for the limitation, in which a distance between the emitter electrode and the collector electrode is in the range of 10 - 200A.

However, figure 3 of Huffman discloses the limitation, in which a distance between the emitter electrode 30 and the collector electrode 39 is in the range of 10 - 200A. Huffman discloses 120 A, which lies in between the range of 10-200A. (Note lines 62-67 col 2)

Therefore, it would have been obvious to one of ordinary skill in the art to form the device of Sung with the limitation of Huffman in order to allow electrons to tunnel through and a potential barrier. (Note lines 43-53 col 2 of Huffman)

With regard to claim 5, Sung discloses all the subject matter claimed except for the limitation, in which d1 is in the range of 5 - 50A.

However, Huffman discloses the limitation, in which d1 is in the range of 5 - 50A. Huffman discloses 40 angstroms, which lies within the range of 5-50A. (Note lines 53-56 col 2)

Therefore, it would have been obvious to one of ordinary skill in the art to form the device of Sung with the limitation of Huffman in order to allow electrons to tunnel through and a potential barrier. (Note lines 43-53 col 2 of Huffman)

With regard to claim 9, Sung discloses all the subject matter claimed except for the limitation, in which the insulator layer comprises a metal oxide.

However, Huffman discloses the limitation, in which the insulator layer (OXIDE SPACERS) comprises a metal oxide. (Note lines 53-56 col 2)

Therefore, it would have been obvious to one of ordinary skill in the art to form the device of Sung with the limitation of Huffman in order to produce a potential barrier with an effective thickness less than that of vacuum. (Note lines 60-67 col 2 of Huffman)

With regard to claim 10, Sung discloses all the subject matter claimed except for the limitation, in which the metal oxide is aluminum oxide.

However, Huffman discloses the limitation, in which the metal oxide (OXIDE SPACERS) is aluminum oxide. (Note lines 53-56 col 2)

Therefore, it would have been obvious to one of ordinary skill in the art to form the device of Sung with the limitation of Huffman in order to produce a potential barrier with an effective thickness less than that of vacuum. (Note lines 60-67 col 2 of Huffman)

With regard to claim 12, Sung discloses all the subject matter claimed except for the step of placing the collector electrode between 10 and 200X from the emitter electrode.

However, Huffman discloses step of placing the collector electrode 39 between 10 and 200A from the emitter electrode 30. Huffman discloses 120 A, which lies in between the range of 10-200A. (Note lines 62-67 col 2)

Therefore, it would have been obvious to one of ordinary skill in the art to form the device of Sung with the limitation of Huffman in order to allow electrons to tunnel through and a potential barrier. (Note lines 43-53 col 2 of Huffman)

Claim 11 is rejected under 35 U.S.C 103(a) as being unpatentable over Sung (2003/0168957).

With regard to claim 11, Sung discloses all the claimed subject matter except for the limitation in which the in which the covering step comprises placing the insulator between 5 and 50A from the emitter electrode. However, it would have been obvious to one of ordinary skill in the art to form the emitter and insulator close together in order to create a potential barrier for electrons to tunnel. (Note par [0002] of Sung) Moreover, there is no evidence indicating the ranges of the height of the fin is critical and it has been held that it is not inventive to discover the optimum or workable range of a result-effective variable within given prior art conditions by routine experimentation. See MPEP 2144.05. Note that the specification contains no disclosure of either the critical nature of the claimed dimensions of any unexpected results arising there from. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicants must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Benjamin T. Liu whose telephone number is (571) 272-6009. The examiner can normally be reached on Mon-Fri 9:30 AM-6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue A. Purvis can be reached on 571 272 1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BTL  
2/9/2007